# Ecosystem Service Values in Natural Resource Management:

# A Decision Support Framework

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BSc; BAppSc (Hons)

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## Declaration

This thesis contains no material that has been accepted for the award of any other higher degree or graduate diploma in any tertiary institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person, except when due reference is made in the text of the thesis.

Shane Olsen 9/4/09

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## Abstract

Mounting evidence indicates that every ecosystem on the planet is showing signs of deterioration and is seriously threatening the ability of nature to provide crucial ecosystem services to human society. Many ecosystem services are in decline due to human ignorance of their value and inadequate social and economic mechanisms to manage them sustainably.

This thesis establishes the basis for greater recognition of ecosystem services in the management of natural resources. This is achieved in three ways. Firstly, the thesis develops a classification of ecosystem services for application to natural resource management issues. The classification overcomes the problems of previous typologies by distinguishing between those services that contribute to other services and the 'end' services themselves. Ecosystem service values can be directly ascribed to provisioning and cultural services. However, the majority of ecological services are of indirect value as they exist primarily to improve and sustain other services.

Secondly, a multi-criteria evaluation (MCE) decision framework is developed to account for changes in ecosystem services resulting from different management scenarios. The MCE process is developed in conjunction with an expert panel, a stakeholder survey, and a cost-effectiveness analysis. The approach involves establishing an ecosystem services conceptual model, developing future management scenarios, and assessing the impact of these scenarios.

Thirdly, a case study is presented using the North West Bay River catchment in Tasmania. Recent local advocacy has sought a reduction in the proportion of the river that is diverted into the City of Hobart's water supply in order to benefit stakeholders downstream of the diversion intakes. Four future scenarios are developed that present a range of possible actions associated with the water management regime. Criteria weights are inserted into the MCE framework based on responses to a mail survey.

The potential changes in ecosystem services are evaluated across the scenarios over a 10-year timeframe. Implementing a range of integrated catchment management measures will have the greatest positive change to the values provided by the North West Bay River. Maintaining the current management regime is likely to lead to an

overall decline in ecosystem service values. Any potential improvements in ecosystem service values are dependent on reducing the uncertainty involved in impact prediction and selecting cost-effective management scenarios. The decision framework provides a number of advantages when compared with alternative valuation approaches through its ability to integrate scientific assessment with valuation techniques, and provide opportunities for knowledge building and stakeholder engagement.

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